

## **REMARKS**

By the *Office Action* of 1 December 2006 marked non-final, Claims 1-17 and 21 are pending in the Application, and all rejected. Applicant and Applicant's counsel thank the Examiner with appreciation for the careful examination.

No new matter is believed introduced by the present *Response*. It is respectfully submitted that the present Application is in condition for allowance for the following reasons.

### **1. Rejection Of Claim 1 Under 35 USC § 103**

The Examiner rejects Claim 1 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,029,805 to Albarda et al. in view of U.S. Patent Publication No. 2006/0044088 to Vaitkus et al. Applicant respectfully traverses this rejection, because this combination of references does not obviate an actuator, as recited in Claim 1, locatable in a flow path and fabricated on the same substrate as an integrated circuit.

The Examiner states that Albarda et al. discloses a valve arrangement in which a membrane is capable of moving between a first position, in which flow is inhibited through a flow path, and a second position enabling flow through the flow path. The Examiner concedes that "Albarda et al. fails to teach that there is an integrated circuit on the substrate." [*Office Action*, p. 3]. The Examiner contends, however, that Vaitkus et al. discloses a switch that can be integrated on the same substrate with other electrical devices. It is respectfully submitted that neither reference nor their combination disclose, teach, or suggest Applicant's claimed invention.

First, the Vaitkus et al. application concerns the inapposite field of micromagnetic switches vis-à-vis Applicant's field of actuators locatable in a flow path. More particularly, Vaitkus et al. discloses a micromagnetic latching switch or "latching relay 100" that "includes a magnet 102, a substrate 104, an insulating layer 106 housing a conductor 114, a contact 108 and a cantilever (moveable element) 112." [Vaitkus et al. ¶ 34]. The "cantilever makes electrical contact with the bottom conductor, and the switch is 'on'." [Vaitkus et al. ¶ 42]. Thus, the switch of Vaitkus et al. is an **electrical switch**, which is inherently compatible with electrical integrated circuit components.

It is well known in the prior art to place electrical components like the electrical switch of Vaitkus et al. on the same single substrate as an integrated circuit. This is because the Vaitkus et al. electronic latching relay is fabricated by a process compatible with integrated circuit

components. As described in Vaitkus et al., its latching switch is a “micro-electronically machined relay for use in electrical or electronic systems.” [Vaitkus et al. ¶ 029].

Vaitkus et al. is silent as to a method or system to fabricate an actuator locatable in a flow path on the same substrate as an integrated circuit. Thus, the teachings of Vaitkus et al. concerning an electric switch respectfully cannot be applied to Applicant’s claimed actuator locatable in a flow path.

Significantly, the prior art is void of an actuator locatable in a flow path enabled to be fabricated on the same single substrate as an integrated circuit. As fully described in the *Specification*, in one example “[t]he present invention overcomes this deficiency in the current art, and provides a microvalve 10 fabrication process that incorporates the microvalve 10 on the same wafer 160 as the fuel cell system to power up an integrated circuit (IC) that is also built on the same wafer 160.” [*Specification*, ¶ 0208].

Second, the switch of Vaitkus et al. is also inapplicable to Applicant’s claimed invention because it is based on a “cantilever (moveable element) 112.” [Vaitkus et al. ¶ 34]. In contrast, Applicant’s Claim 1 recites a “membrane capable of moving through a first position and a second position.” A membrane-based actuator and a cantilever-based switch are patentably distinct devices. Therefore, Vaitkus et al. is inapplicable, under 35 U.S.C. § 103, as it is not “in the field of applicant’s endeavor or . . . reasonably pertinent to the particular problem with which the inventor was concerned.” MPEP § 2141.01(a).

Third, the Examiner states that it would have been obvious to combine Vaitkus et al. with Albarda et al. to “integrate a mem switch on the same substrate with other electrical devices in order to reduce the size of the overall apparatus.” [*Office Action*, p. 3]. Applicant respectfully submits that Applicant’s claimed invention was not simply to “reduce the size of the overall apparatus,” but to incorporate a previously non-compatible actuator into a CMOS compatible process, which results in numerous previously unobtainable benefits. In addition to allowing for CMOS compatibility and integrated circuit compatibility, the single substrate fabrication enables, among other advancements, (i) the actuator to exhibit low power consumption, (ii) the actuator to be more reliable due to the lack of a need to bond and align the actuator, (iii) the actuator to be more stable as the actuator can remain latched without an induced electromagnetic force, and (iv) the actuator to exhibit fast response times due to the small overall mass of the actuator. [*Specification*, ¶¶ 0083, 0110, 0112, 0184, 0209, 0286].

Neither of the cited references alone, nor their combination, anticipate, disclose, teach, or suggest what Applicant claims herein. Thus, it is respectfully submitted that Claim 1 is allowable, and all claims depending on Claim 1, Claims 2-11, are also allowable.

## **2. Rejection Of Claims 1-7 and 10-17 Under 35 USC § 103**

The Examiner rejects Claims 1-7 and 10-17 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 6,123,316 to Biegelsen et al. in view of Albarda et al., and further in view of Vaitkus et al. Applicant respectfully traverses this rejection, as Biegelsen et al. does not cure the deficiency discussed above regarding the failure of the combination of Albarda et al., and Vaitkus et al. to obviate an actuator locatable in a flow path fabricated on the same substrate as an integrated circuit.

The Examiner concedes that Biegelsen et al. and Albarda et al. fail to disclose an actuator locatable in a flow path formed on a single substrate with an integrated circuit. [*Office Action*, p. 4]. The Examiner suggests that Vaitkus et al. discloses a mem switch that can be integrated on the same substrate with other electrical devices. As described above, Vaitkus et al. does not disclose an actuator locatable in a flow path but rather a “micro-electronically machined relay.” [Vaitkus et al. ¶ 029]. Therefore, the teachings of Vaitkus et al. are inapplicable to Applicant’s claimed invention.

The art is replete with references illustrating that low power, quick response time, and CMOS capability of the actuator in Applicant’s independent Claims 1 and 12 were unreachable prior to the present invention. Neither the cited references, alone, nor their combination, anticipate, disclose, teach, or suggest what Applicant claims herein. Thus, it is respectfully submitted that Claims 1 and 12 are allowable, and all claims depending on Claims 1 and 12, Claims 2-11 and 13-17, are also allowable.

## **3. Rejection Of Claims 8-9, 14-17, and 21 Under 35 USC § 103**

The Examiner rejects Claims 8-9, 14-17, and 21 under 35 U.S.C. §103(a) as being obvious over Biegelsen et al. in view U.S. Patent No. 5,475,353 to Roshen et al. Applicant respectfully traverses this rejection.

The Examiner concedes that Biegelsen et al. does not disclose a membrane being located between a permanent magnet and the electromagnetic force generator as required by Applicant’s Claim 8. Yet, not only does Biegelsen et al. fail to show a membrane being located between a permanent magnet and the electromagnetic force generator, but it also discloses a microvalve

that requires the assembly of many layers necessitating alignment and bonding. [Biegelsen et al., figures 11 and 12]. Furthermore, Roshen et al. does not remedy the deficiencies of Biegelsen et al. Roshen et al. does not disclose an actuator fabricated on a single substrate. Roshen et al., in fact, discloses an actuator 10 that has a lid 30, to which a soft magnetic plate 28 is attached. [Roshen et al., Col. 1, l. 67 – Col. 2, l. 20]. None of the cited art provides motivation to provide what the Applicant claims herein. Thus, it is respectfully submitted that Claims 8-9, 14-17, and 21 are allowable.

#### **4. Fees**

No Claim fees are believed due. The number of Claims pending remains less than those filed. Further, this *Response* is being filed within three months of the *Office Action*. Thus, it is believed no extension of time fees are due. Nonetheless, should any fees be due, authorization to charge deposit account No. 20-1507 is hereby given.

## CONCLUSION

By the present *Response*, the Application has been in placed in full condition for allowance. Accordingly, Applicant respectfully requests early and favorable action. Should the Examiner have any further questions or reservations, the Examiner is invited to telephone the undersigned Attorney at 404.885.3695.

Respectfully submitted,

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/trentonaward59157/

/trentonaward59157/

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Trenton A. Ward  
Registration No. 59,157

Troutman Sanders LLP  
Bank of America Plaza  
600 Peachtree Street, N.E., Suite 5200  
Atlanta, Georgia 30308-2216  
United States  
Phone: 404.885.3695  
Fax: 404.962.6818